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(54) Strap fastener

(57) A strap fastener for securing, for example, a bundle of cables or a hose has three parts which may be assembled at the time of fitting the fastener. The three parts are a flexible band (1) which is cut to a required length from a supply of band material in a dispenser, and a band receptacle (4) comprising a fixed member (5) and a screw (6). Since the band can be of variable length, the fastener is suitable for securing articles of widely differing sizes. The screw acts radially relative to the secured article, largely preventing movement of the fastener around the article when it is being fitted.

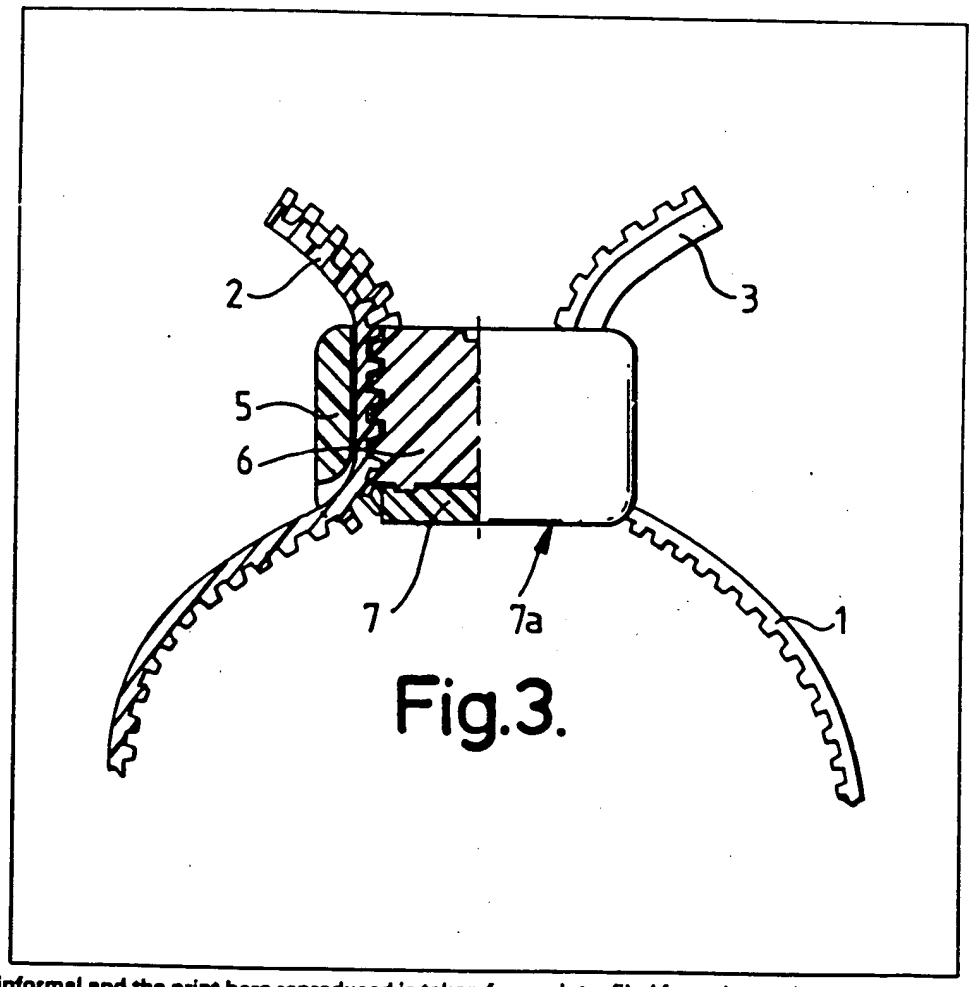

Fig.3.

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The drawings originally filed were informal and the print here reproduced is taken from a later filed formal copy.

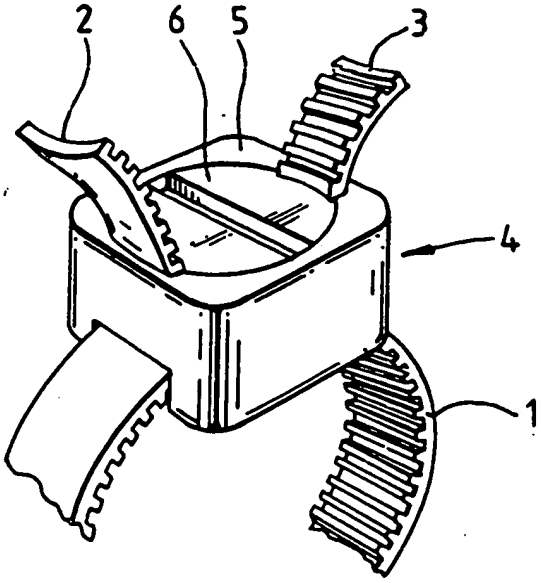

Fig.1.

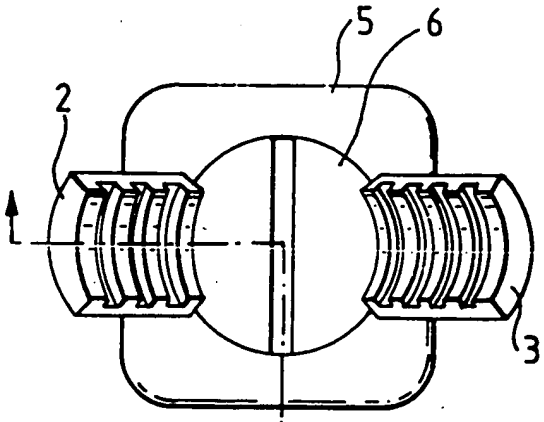

Fig.2.

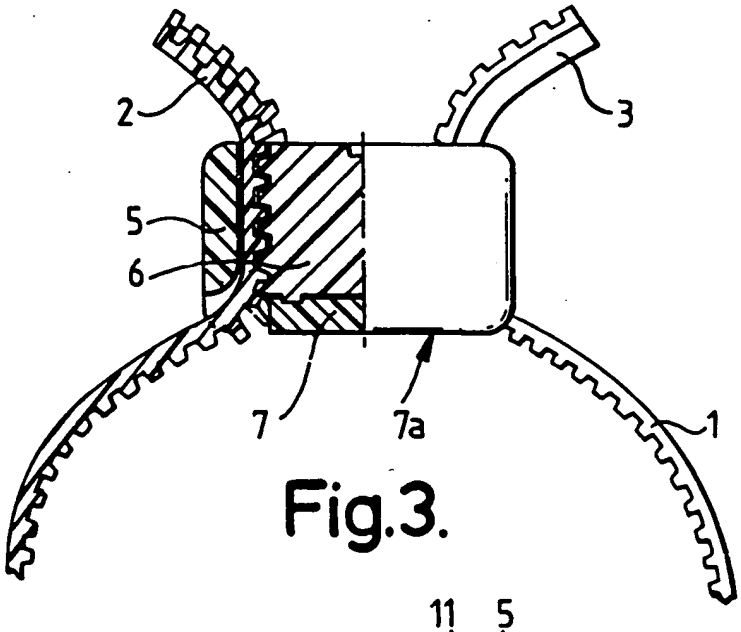

Fig.3.

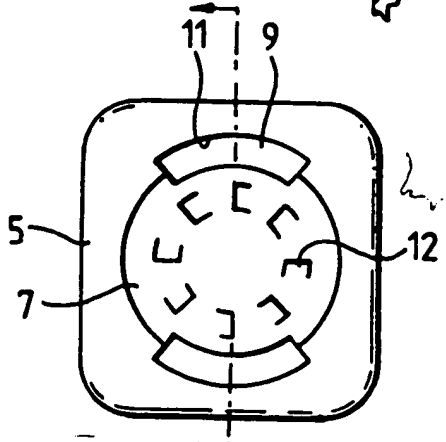

Fig.4.

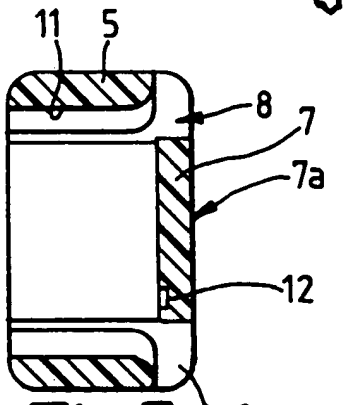

Fig.5.

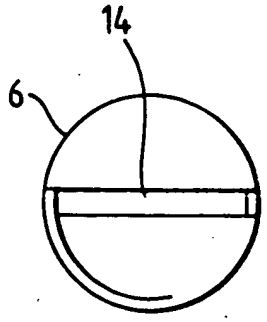

Fig.6.

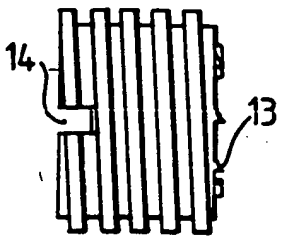

Fig.7.

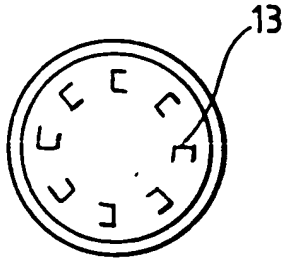

Fig.8.

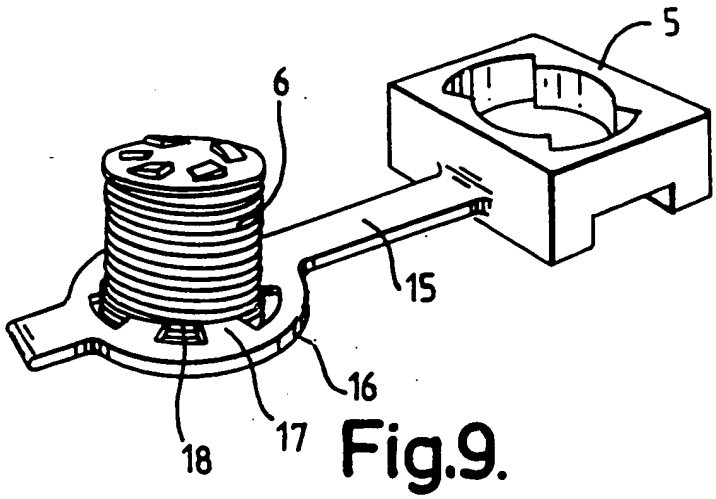

Fig.9.

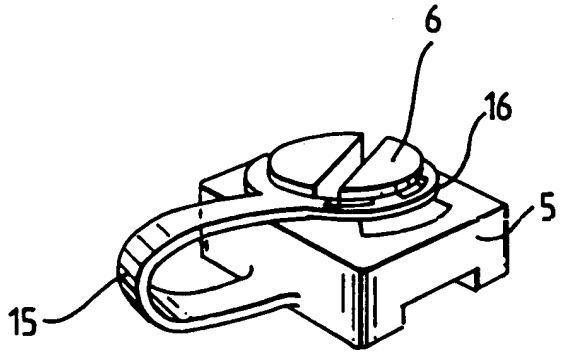

Fig.10.

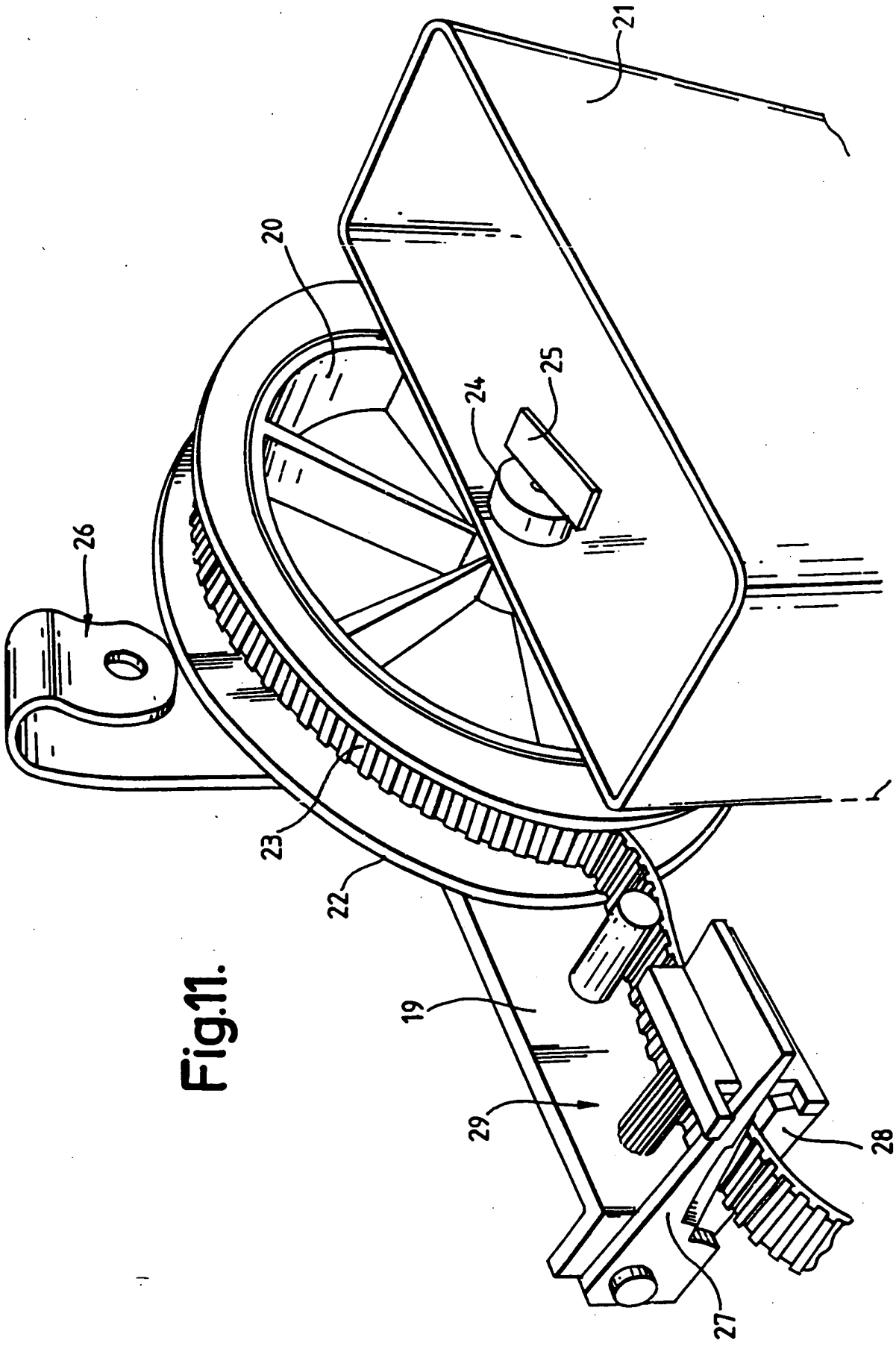

Fig.11.

SPECIFICATION
Strap fastener

This invention relates to a strap fastener for holding a number of cables or pipes in a bundle or for securing a hose on a pipe end.

Known fasteners of this description include the widely used screw hose clip which has a metal band for encircling the hose and a screw mechanism in the form of either a worm drive or nut and bolt arrangement for tensioning the band. Such hose clips are available in a variety of sizes, and each size of clip is suitable only for a restricted range of pipe diameters. This restriction is due mainly to the inflexibility of the metal band and the size of the screw mechanism. A screw clip of this kind is normally passed over the end of the hose before it is fitted to the pipe end since detachment of the free end of the band from the screw mechanism is a time-consuming operation. The clip is therefore unsuitable for fitting on a hose which has no free end. A further disadvantage of this and similar screw clips is that the screw axis is tangential to the band so that when the clip is being tightened and before it grips the hose, it tends to rotate around the hose away from the screwdriver.

A known cable-wrapping clip comprises a plastics band with a serrated outer surface and with an integral slotted receptacle at one end. In use, the free end of the band is passed around the bundle and inserted tangentially relative to the general surface profile of the bundle into the receptacle where it is held by one or more teeth which engage the serrations on the band. These teeth act in the manner of a ratchet and prevent withdrawal of the band once it has been inserted. Thus, once the clip has been tightened around the bundle it is virtually impossible to remove it without cutting or otherwise destroying it. Like the hose clip already described, such cable-wrapping clips are available in a variety of sizes. However, in order to tension the clip the free end of the band must have sufficient length to enable a person to grip it effectively between his fingers so as to be able to apply sufficient tensioning force. This relatively long free end is untidy in appearance and can interfere with neighbouring components.

It is an object of the invention to provide a fastener which avoids at least some of the above disadvantages.

According to this invention a strap fastener comprises: (i) a flexible band for encircling a workpiece, the band having a serrated or toothed surface; (ii) a fixed member having a surface for engaging the workpiece; and (iii) a threaded member received by the fixed member and rotatable relative thereto about an axis generally perpendicular to the said surface for engaging the workpiece; the fixed member and the threaded member forming a band receptacle and defining a passage for receiving the band with its serrated surface engaging the threaded member so that rotation of the threaded member causes the band to be driven through the passage in a direction generally parallel to the axis of rotation.

In a preferred device in accordance with the invention the receptacle comprises a screw and a screw housing, the housing being so shaped that two passages are formed between the housing and the threaded surface of the screw on diametrically opposite sides of the screw. Spaced portions of the band are trapped between the housing and the screw in respective passages, with the intermediate portion of the band encircling the workpiece. Clockwise rotation of the screw in the housing causes both spaced portions of the band to be drawn away from the workpiece in a direction approximately parallel to the screw axis thereby tensioning the band around the workpiece. In this preferred device the screw axis is radially positioned with respect to the ring formed by the band around the workpiece. Therefore, whether the worm screw end has a simple screwdriver slot, a "cross-head" type screwdriver receptacle, or a hexagon socket, the force applied to the screwdriver tends to push the screw and the housing towards the workpiece rather than around the workpiece as is the case with tangentially acting screw arrangements.

An advantage of the device in accordance with the invention is that the band length can be selected by the person fitting the device, since the band is a separate component from the receptacle, and is in general only inserted in the latter after the band has been passed around the workpiece. The band can therefore conveniently be supplied in the form of a reel from which the required length can be selected and cut off. Providing the band in a reel also has a cost advantage.

A further advantage deriving from the separate component band is that the fastener can be assembled around a workpiece which has no free end, for example a bundle of cables which has already been connected at both ends.

Since the tensioning means is releasable and both ends of the band can be withdrawn from the receptacle, the fastener is removable and reusable. Thus a repairman, for example, is not required to have a supply of spare fasteners and is therefore not tempted to leave the workpiece loose after having carried out the repair.

According to another aspect of the invention, there is provided a method of securing a fastener around a workpiece, the method comprising the steps of (i) provindg a dispenser containing a continuous length of flexible band material having a serrated or toothed surface, the dispenser having a cutting device mounted thereon; (ii) providing a supply of band receptacles each comprising a fixed member and a threaded member, and each shaped to define a passage or passages for receiving the band material; (iii) withdrawing a required length of band material from the dispenser and cutting the band material with the cutting device to part the required length from the said continuous length to form a fastener band; (iv) passing the band around the workpiece; (v) inserting the end portions of the band into the

passage or passages in one of the band receptacles, and (vi) rotating the threaded member in the fixed member to tighten the band around the workpiece. The dispenser may conveniently comprise a reel of band material and a guillotine cutting device and may have means for attaching it in an accessible position on, for example, an operator's waist belt.

The invention will now be described by way of example with reference to the drawings in which: —

Fig. 1 is a perspective view of an assembled fastener;

Fig. 2 is a plan view of the fastener of Fig. 1;

Fig. 3 is a partially sectioned side view of the fastener of Fig. 1;

Fig. 4 is a plan view of the band receptacle of the fastener of Fig. 1, with the screw removed;

Fig. 5 is a sectional side view of the receptacle of Fig. 4;

Figs. 6, 7 and 8 are respectively a plan view, side view and underside view of the screw of the fastener shown in Fig. 1;

Figs. 9 and 10 are perspective views of a modified band receptacle with the screw respectively removed from the housing, and inserted in the housing; and

Fig. 11 is a perspective view of a band material dispenser.

Referring to Figs. 1 to 3, an assembled fastener has a band 1 with spaced portions 2 and 3 received in a receptacle 4. The receptacle comprises a housing 5 of square cross-section and a screw 6 which is seated against a lower wall 7 of the housing 5. The band 1 is trapped between the housing 5 and the screw 6 in apertures which have an arcuate cross-section (see Fig. 4) and which terminate at their lower ends in side openings 8 (see Fig. 5). When the screw 6 is seated against the wall 7, its upper surface is flush with the outside of the housing 5.

Preferably, all three components 1, 5 and 6 are made of a plastics material, and in the case of the band 1, the material is sufficiently flexible to allow the band to adopt a curved cross-section for effective engagement with the screw thread of the screw 6.

Referring to Figures 4 to 8, which show the two components of the receptacle, it can be seen that the housing 5 has channels 9 and 10 which combine with the screw 6 to form the passages through which the band 1 passes. The surface 11 of each passage is smooth to allow smooth passage of the band 1 in the passage, and is curved adjacent the opening 8 to minimise the frictional resistance occurring as the band is distorted and drawn into the receptacle. The upper surface of the lower wall 7 has a plurality of inclined indentations 12 which, in conjunction with a plurality of wedge-shaped projections 13 on the screw 6, constitute a ratched which resists anti-clockwise rotation of the screw 6 when it is seated against the housing lower wall 7. This resistance is additional to the inherent resistance to rotation caused by friction between the screw 6 and the band 1, and improves the security of the fastener once it has been tightened around the workpiece.

The screw 6 is provided with a screwdriver slot 14. However alternative means for applying rotational force to the screw may be used, such as a "cross-head" socket, a hexagon socket, or an upstanding flange for turning the screw by hand. The slot 14 is preferably sufficiently wide to accept a small coin as a turning implement.

The screw 6 may be linked to the housing 5 by means of a flexible arm 15 as shown in Figs. 9 and 10. The arm 15 is moulded integrally with the housing 5 and has a ring 16 at its free end for holding the screw 6. The ring 16 has inwardly directed teeth 17 which are received in a groove 18 in the screw to allow rotation of the screw when inserted in the housing 5 as shown in Fig. 10.

Referring to Fig. 11, a dispenser which provides a convenient means for carrying and dispensing the component parts of a large quantity of fasteners has a backplate 19 on which is mounted a wheel 20 and a bin 21. The wheel 20 receives a reel 22 of band material 23 and is rotatably mounted together with the bin 21 on a spindle 24. A catch 25 is provided to hold the wheel and bin on the spindle 24. The bin 21 is used to carry a supply of housings 5 and screws 6, and, being pivotably mounted, will remain with its opening uppermost when a person wearing the dispenser with the strap 26 attached to his waist belt stoops down. The backplate 19 also carries a guillotine for cutting off a required length of band material 23. The guillotine comprises a pivotable blade 27 and a cutting block 28. The band material is fed from the reel 22 to the guillotine through a channel 29 which houses a ribbed roller 30. This roller is frictionally mounted on the backplate 19 so as to hold band material 23 stationary in the channel 29 when the guillotine is operated.

The sequence of operations required to place a fastener in position around a workpiece is as follows. An estimated required length of band material 23 is pulled from the dispenser and sliced off with the guillotine. This required length, which is the band 1 shown in Figs. 1 to 3, is then passed around the workpiece, which may be for example a bundle of cables or a hose, with the two free end portions 2 and 3 projecting side-by-side from the workpiece. A housing 5 is selected from the bin 21 and fitted onto the end portions 2 and 3, each portion being passed through a respective opening 8 in the housing 5. A worm screw 6 is then removed from the bin and pushed between the two projecting end portions 2 and 3 until it is at least partly seated in the housing 5. A screwdriver is inserted into the screw slot 14 and the screw is rotated, thereby forcing the screw between the two end portions of the band 1 towards the lower wall 7 of the housing 5. When the screw 6 reaches the lower wall 7, further rotation results in both end portions of the band 1 being drawn away from the workpiece, thereby tightening the band 1 around the workpiece, with the surface 7a

engaging the workpiece. When the screwdriver is removed, frictional resistance and the identations 12 prevent loosening of the fastener. The fastener can be removed by applying a sufficient anti-clockwise rotational force to the screw 6 to overcome the resistance, so as to loosen the band 1 and withdraw the screw 6. The fastener can then, if desired, be used again.

CLAIMS

1. A strap fastener comprising: —

(i) a flexible band for encircling a workpiece, the band having a serrated or toothed surface;

(ii) a fixed member having a surface for engaging the workpiece; and

(iii) a threaded member received by the fixed member and rotatable relative thereto about an axis generally perpendicular to the said surface for engaging the workpiece;

the fixed member and the threaded member forming a band receptacle and defining a passage for receiving the band with its serrated surface engaging the threaded member so that rotation of the threaded member causes the band to be driven through the passage in a direction generally parallel to the axis of rotation.

2. A fastener according to claim 1, wherein the fixed member and the threaded member define two passages for receiving respective spaced portions of the band, so that rotation of the threaded member causes both portions of the band to be driven in parallel directions through the passages.

3. A fastener according to claim 2, wherein the threaded member is in the form of a removable screw housed in a generally cylindrical cavity in the fixed member, the walls of the cavity having channels defining the sides of the passages.

4. A fastener according to claim 3, wherein the cavity has an open end on the opposite side of the fixed member from the surface for engaging the workpiece, the other end being substantially closed.

5. A fastener according to claim 4, wherein the screw and the passages are arranged such that tension in the band between the two spaced portions urges the screw against the substantially closed end of the cavity.

6. A fastener according to claim 5 wherein the closed end of the cavity and a corresponding end of the screw have cooperating projections and recesses forming a ratchet mechanism.

7. A fastener according to any preceding claim, wherein the or each passage has a band entry opening bordering the surface for engaging the workpiece.

8. A fastener according to claim 2 wherein the band has two free end portions, each of which is received in a respective one of the passages and projects from the passage on the opposite face of the fixed member from the surface for engaging the workpiece.

9. A fastener according to any preceding claim wherein the or each passage is arcuate in cross-section.

10. A fastener according to any of claims 3 to 6, wherein the screw is attached to a flexible arm which is integral with the fixed member and has a ring at one end, the ring being received in a groove formed in the screw to allow rotation of the screw relative to the ring.

11. A fastener according to any of claims 4 to 6, wherein one end of the screw is flush with a surface of the fixed member surrounding the open end of the cavity when the other end of the screw is in contact with the closed end of the cavity.

12. A fastener according to any preceding claim wherein the band, the fixed member and the threaded member are of plastics material.

13. A method of securing a strap fastener around a workpiece, comprising: —

(i) providing a dispenser containing a continuous length of flexible band material having a serrated or toothed surface, the dispenser having a cutting device mounted thereon;

(ii) providing a supply of band receptacles each comprising a fixed member and a threaded member, and each shaped to define a passage or passages for receiving the band material:

(iii) withdrawing a required length of band material from the dispenser and cutting the band material with the cutting device to part the required length from the said continuous length to form a fastener band;

(iv) passing the band around the workpiece;

(v) inserting the end portions of the band into the passage or passages in one of the band receptacles, and

(vi) rotating the threaded member in the fixed member to tighten the band around the workpiece.

14. A strap fastener constructed and arranged substantially as herein described and shown in Figs. 1 to 10 of the drawings.

15. A method of securing a strap fastener around a workpiece substantially as herein described with reference to the drawings.

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